THE Chemist

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AMERICAN INSTITUTE OF CHEMISTS

What Makes a Profession Click? 455

The Responsibility of the University in Training the Chemist for Industry 459

Licensing Establishes Merely a Minimum 463

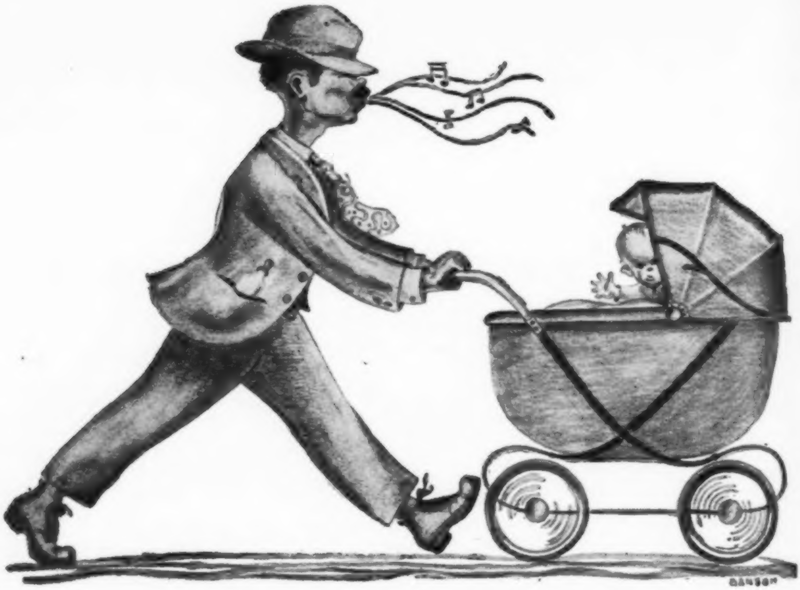
The Chemist Studies Ancient Embalming 465

Council 483

Chapters 483

Advertising Index 494

Chemical Condensates 495



The Chemist

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What Makes A Profession Click?

M. L. Crossley, F.A.I.C.

Director of Research, American Cyanamid Company

ONENESS of purpose is the adhesive which holds a profession together and assures solidarity of action. It does not arise spontaneously. It must be developed and then maintained by great organizational effort. A smoothly functioning organization capable of administering judicious control is necessary for its maintenance. It is the one thing which gives character to a professional organization and makes its power felt. It makes the profession click.

Unity of purpose and solidarity in action must be secured by the chemical profession if it is to receive proper recognition as a profession. This can be had only through the constant efforts of a strong and efficient organization devoted entirely to the problems of the profession. The type of service rendered by the chemist places him in an important relationship with the public and imposes on him an obligation to see that the quality of the service rendered is high. It requires organization to insure the fitness and character for the establishment of the professional standards which guarantee excellent service.

The profession must assume the obligation for seeing that its members, individually and collectively, are worthy of the confidence of society. The dignity of the profession is gauged by the social conscienceness of the degree to which this confidence is well placed.

A professional organization has certain major functions to fulfill. It must establish for its members such standards of fitness and conduct as will assure public confidence and esteem. It must provide effective means for enforcing the rules of conduct and of measuring professional fitness of its members. It must develop public appreciation of the importance of the service rendered by the profession, ever upholding its dignity and prestige. Finally, it must establish and maintain scales of salaries and fees commensurate with the type of service rendered. A composite of all of these organizational activities is essential in establishing a proper social and economic status for the chemist.

A strong and active organization is needed to achieve the aims of the chemical profession. This is true

whatever means are used to secure the desired results. It is not enough to set standards; they must be maintained. The means of maintaining these standards may be different but the principle on which they are based must be sound and inflexible.

There is probably no one method of satisfying all of the conditions surrounding the problem of obtaining adequate recognition of the professional standing of the chemist. This is true of all scientific professions. State licensure may be a necessary means to the end. However it is not enough. Without proper organizational effort it may result in lowering the professional status of scientific men. It will help to insure a high type of service and to protect the public from the predatory ravages of charlatans and parasites of the profession only when strengthened by the work of a strong professional organization.

The same is true of the economic problems of the chemist. They are common to the profession and must be solved in accordance with a principle big enough to receive general acceptance. The power that comes from united effort is needed to establish and maintain the chemical profession.

THE AMERICAN INSTITUTE OF CHEMISTS was founded to fulfill this purpose. The task is still before it. The growing pains of organization should have subsided by now and left a body tempered for efficient performance. Is it ready to grasp the opportunity? It seems clear that it cannot continue to exist on promises. The time is ripe for action. The profession is at sea seeking the port of public confidence and respect. Overhaul the machinery of the Institute, oil its works that it may be able to perform its functions smoothly and effectively. Establish a definite policy for guiding the profession to its proper destination and proceed to put it into effect with dignity, boldness and courage.

First, tell the world what we know the chemist to be and how we propose to see that he gets that way. Work with the schools to see that he is properly educated and lay down a definite procedure for establishing when a person has qualified as a chemist. Then, strive to help the chemist to obtain the recognition and financial returns his services demand.

The influence of the INSTITUTE in representing the chemical profession can be no greater than the unity of purpose it possesses will permit. The INSTITUTE must adopt a definite, unified policy and have the means of enforcing it. The problem is to formulate a policy which will be effective in producing the desired results. The first essential is to have the organization required to put into effect the policy decisions.

Then, the director must be a man of commanding personality and dis-

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tinction. He must have the persuasive power to obtain readily a hearing with both educator and employer of chemists. He must also win the respect and have the confidence of the majority of chemists. His actions must be confined within the policies laid down by the organization and made known to all members. He must be decisive, firm, and fair in all his dealings. He speaks for the INSTITUTE and through it for the profession of chemistry. What he says should be tempered by wisdom and timed with good judgment. It is his major task to lead the INSTITUTE so as to enable it to assure the highest type of service by the chemical profession and to secure for chemists the recognition and financial rewards they deserve.

One of two courses of action could be employed to obtain improved economic conditions for the profession; unionization or a dignified INSTITUTE plan based on sound and equitable principles. The former is undesirable. The methods of the labor union are not suitable for a scientific profession. Collective bargaining, employing the weapon of the strike to secure results, is not conducive to the establishment and maintenance of the conditions under which scientific thought and activity flourish.

The relationship between the chemist and his employer must be such as to insure mutual confidence and esteem. The economic advantages must be secured without lowering the dignity of the profession. Financial rewards must be based on full recognition of the value of the service rendered. Collective bargaining must be conducted on a higher plane than that of the labor union. It must secure fair compensation for chemists without impairing their position in the scientific world and without sacrificing their freedom. Scientific ideas need the atmosphere of intellectual freedom to develop. They cannot germinate and take root in the soil of collectivism, fertilized by regimentation and cultivated by force.

The tendency to encourage local groups of chemists to organize on the plan of the labor union is regrettable. It can only be disappointing to them and destructive of real professional solidarity. It is obvious that such small local groups do not have the necessary force to make bargaining power effective. To accomplish their aims they would be forced into the outstretched arms of the labor unions. No greater catastrophe could happen to the chemical profession.

The other course of action seems to me the wiser. Strengthen the INSTITUTE so that it is a real chemical professional organization with guts and teeth. Let it take over the professional problems now being handled by other chemical societies. Secure the cooperation of the several interested societies in building the strongest possible professional organization.

There is plenty of work for all. The best results will be secured by concentrated effort. There should be no serious difficulty in finding a way to bring about the cooperation which will permit of the greatest specialized effort. The other chemical societies and the INSTITUTE should get together and allot to each the work it should do best; delegating to THE AMERICAN INSTITUTE OF CHEMISTS the professional problems. In this way the greatest possible good would be accomplished by all.

The policy with respect to the economic problems of the profession should be definite, wise, and equitable. It should establish the starting salaries for chemists without experience and provide a basic plan for merit increases. The starting salary should be the same for equal education, independent of race, creed, color or sex. No action on the part of the INSTITUTE should commit the profession to a policy of standard salaries for experienced chemists independent of their capabilities. The individual chemist must retain his right to rise to any height his capacity permits.

Fundamental in any plan that will provide a satisfactory economic status of the chemist is the recognition of the principle that salary alone cannot compensate fully for professional service. The investment made by professional service should be amortized and the cost of the amortization provided for in the price of goods and service. The plan must also permit the chemist to acquire a vested right in the money collected for the amortization of his service from the start and this right must not be limited to his continuing in service with the same company. He must be able to transfer from one company to another and have his amortization continue without interruption. The voluntary establishment by industry of retirement plans in the last few years justifies the belief that the above is sound in principle and capable of realization if the proper amount of effort is made to secure it for the profession.

Generalizations of desirable aims are useful only when they lead to concrete, practical plans. Too often they merely mesmerize the governing body of an organization into inactivity. All the thought and effort put into studies of the problems of the chemical profession and in reports to the INSTITUTE is wasted unless some concrete policy is adopted and put into effect. The need for action is urgent. Delay makes for more and more confused thinking and disorganized activities, weakening the will to achieve that unity of purpose essential to professional solidarity. Time marches on regardless of the chemist's professional problems! When will the profession click?

Responsibility of the University In Training Chemists for Industry

Dr. B. K. Summerbell

Northwestern University, Evanston, Ill.

TWO of the words in our topic require qualification or explanation. The word "responsibility" implies that the university is accountable to someone or something, and many of my industrial friends assume that the responsibility is to industry. The university has only one real and vital responsibility, and that is to the student.

The program offered should be designed with the welfare of the student in mind at all times, and should be aimed at helping to prepare the student for satisfactory and effective living. The university has a secondary obligation to society, namely, to supply the trained personnel that enables industry to carry on essential production and improve living standards. No technical need, however, of a commercial venture should be allowed to dictate study programs that will result in over-specialization and narrow personalities.

The student as a potential citizen and person is more important than the student as a potential chemist. In all that follows it is assumed that sufficient work in the humanities and the social sciences will be included. Even against the usual inclination of the science majors, it should be insisted that every university student become aware of his or her obligations as a member of society and of the opportunities for fuller living to be found in the arts and literature.

The other word to which I take exception is "training". We can train a dog or a soldier or a technician, but I doubt that any university can "train" a creative scientist such as a chemist. We can give the student a chance to learn those things which he will need to know, and we can give him practice with the physical and mental tools of the working scientist; but the word "train" has an implication of automatic response that is quite foreign to the thinking processes of a creative scientist.

He Learns What Has Been Done

The budding scientist or engineer is usually first given a chance to learn what has been done. As he comes to the university, he is ill-equipped to take advantage of his opportunity. Although he has been hearing, speaking, reading, and writ-

ing the English language for fifteen years, his proficiency in handling his native tongue usually leaves much to be desired. An understanding of the very precise and exact meanings of any scientific article requires the most careful reading possible. During the student's stay at the university, he must be given an opportunity to learn to read such articles with appropriate attention to detail.

The bulk of chemical literature is so great that the student must also acquire the habit of rapidly scanning material of less direct interest. Even after much direct and indirect training in writing, the one dominant criticism that continually comes back to every university is that the graduates cannot write reports. The university has a very definite responsibility in this field, but the problem is poorly handled at most institutions. The buck is sometimes passed to the English department or to the high schools, but the blame rests squarely on the science teachers who accept examinations, term papers, and research reports of low quality.

For several generations, German has been essential for a serious chemist. It will continue to be so for a number of years, and present indications are that Russian will become a medium of prime importance for learning the things that have been done. Mathematics is a language necessary for the precise and accurate statement of many of the more important current theoretical ideas. The person devoid of mathematics simply cannot read an article or text in physical chemistry.

Much of the actual chemical subject matter of the undergraduate is for the puropse of building vocabulary. Such terms as "Wurtz reaction" or "vapor density by the Hoffman method" occurring in chemical literature must be interpreted correctly by the reader or the entire continuity is lost. Beginning organic chemistry is in no small part concerned with learning the words by which we distinguish the varieties of carbon compounds. The chemistry must not be pure verbalism; but these words must be associated with substances encountered in demonstrations, laboratory and, if possible, in the factory.

The emphasis I have placed on vocabulary, English, German, mathematical, and chemical, may seem exaggerated. Actually we think with words. Before we can do any chemical thinking we must acquire the vocabulary.

Sometime in his university career, the student must learn how to locate particular wanted information in the great miscellany of journals, textbooks, treatises and encyclopedias. The processes by means of which we make available for our own purposes a particular experiment performed years ago in an out of the way college and published in an obscure

journal are often more important than the specific subject matter of the most important courses. No chemist can know all about what has been done, but the successful ones are able to find information when they need it.

He Learns What Can Be Done

When the student has acquired a sufficient vocabulary to start thinking in chemical terms, he will begin to appreciate and understand the physical and mental techniques that are utilized by the working chemist. He will learn how the analytical balance can be used as Liebig used it to determine carbon and hydrogen content, and how Selwood uses the modern magnetic modification to search out unpaired electrons. He will learn to look at a particular piece of physical apparatus, and to ask himself how it can be used in this or that problem.

The student will develop a number of mental techniques. He will learn how the phase rule can be applied to problems in the field of crystallization, and how calculus can be put to work in the designing of a distilling column. He will learn the technique of mentally analyzing a problem and subdividing it into questions for which direct experimental answers may be obtained. He will learn the theory of errors in measurement, so that he can appreciate the limitations as well as the possibilities of a method.

Into the four or five or seven years that the chemist or engineer spends at the university, only a limited amount of such material can be crowded. It must be a sampling, but it should be a good sampling. Much of the selection of course material is inherited from previous generations, and new material usually added, whereas common sense would dictate that the new should be substituted for something that was obsolete or of less importance. Some suggest that patent law, advertising, accounting, and marketing be added to the curriculum. Industrial men can make a real contribution by constructively criticizing the selection of physical and mental techniques for the chemical curriculum, but they will be most helpful if they tell the universities what to eliminate as well as what to add.

He Learns What He Can Do

The student needs not only the chance to read about mental and physical techniques, but an opportunity to use them in order to appraise his own potentialities. The university has a definite responsibility to discourage those who cannot think, or who think crookedly or who think dishonestly, and this obligation is discharged adequately and even with some enthusiasm by most chemistry departments.

The more positive duty of building confidence to tackle the unknown and a large desire to do so is not sufficiently emphasized by many institu-

tions. The popular picture of the chemistry major as a dreary grind who has peculiar mental and social habits is true altogether too often. I am not proposing that some cheap course in how to make friends and influence people be added to the curriculum, but I do think that a university graduate should be able to shake hands decently and to look an interviewer in the eye. The desired self-confidence which comes with accomplishment and opportunity for individual investigation should be a part of the curriculum for every chemist or engineer.

We must continually stress in our thinking that the primary responsibility is to the student. The student is a person, and to this person the university should offer an opportunity to learn what has been done in the field of chemistry, what can be done, and what he, personally, is capable of doing.

I would like to suggest as the subject for a later symposium that we take up the responsibility of industry. I detect a growing tendency on the part of industry to snatch personnel from the university faculties. If this movement were to result in higher salaries for chemistry teachers it would be ideal, but if it produces faculties constituted of the mediocre or the peculiar that are left after industry has taken the brilliant and the promising, then our system of free enterprise is doomed. The chemical industries have an obvious interest in the quality of university teaching. I hope they will face their responsibility.

Braidech Appointed Director Of Research

Mathew M. Braidech, F.A.I.C., formerly professor of industrial and sanitary chemistry at The Case School of Applied Science, Cleveland, Ohio, has been appointed director of research for the Division of Engineering Standards and Fire Protection of the National Board of Fire Underwriters, New York, N. Y.

His duties will include problems connected with fire and related hazards; materials of construction and methods for their use; and protective methods in safe-guarding life and property.

Fiedler With Bjorksten

The Bjorksten Laboratories, 185 N. Wabash Avenue, Chicago, announce that Stuart O. Fiedler has joined the staff as research associate. Mr. Fiedler was formerly with the C. F. Burgess Laboratories, E. I. DuPont de Nemours and Company (as group leader on spun rayons), and the Quaker Chemical Products Corporation, in charge of textile research.

Vincent Now Technical Director

G. P. Vincent, manager of the sales and technical service departments of Mathieson Alkali Works, has been appointed technical director.

Licensing Establishes Merely A Minimum

Jerome Alexander, F.A.I.C.

IN discussing the question of licensing, one important aspect is generally overlooked, and is certainly not given adequate consideration. All that a license can be expected to do is to indicate that the holder has given, at the time of his examination, evidence satisfactory to some Board that he is a person of good character and principles, and that he was at the time of his examination sufficiently well-grounded in the existing knowledge and art of his profession to be permitted to practice it. There is a tacit understanding that a professional man will keep up with progress in his field, and improve his knowledge and capabilities.

A license does not establish the competence of a physician to treat any and all illnesses, or to perform any and all operations; nor of a lawyer to try cases of all kinds (patents, wills, real estate, crime, bankruptcy); nor of an engineer to plan bridges and skyscrapers, autos and airplanes, chemical plants and smelters, steamships and automatic machines; nor of a chemist to plan manufacturing processes of all kinds, organic and inorganic, or to make analyses and determinations of all kinds with the aid of the multitudinous types of apparatus now available in addition to graduated glassware and the gravimetric balance. The license indicates merely that at the time of his examination its possessor showed the *minimum requirements* for entrance into his chosen profession.

From the standpoint of the public, licensing aims to shut out quacks and imposters who have neither the necessary basic training nor the professional conscience which leads a professional man to accept only work for which he has acquired adequate special training and experience. From the standpoint of honest professional men. licensing shuts out the unfair competition of dishonest charlatans and protects the reputation of the profession at large.

SYLLABUS OF A COURSE OF LECTURES ON EGYPTIAN ANTIQUITIES

More especially as connected with the Processes of Embalming:

By T. J. PETTIGREW, F.R.S., F.S.A., F.L.S., &C. &C. &C.

Author of a "History of Egyptian Mummies," &c.

These Lectures will be delivered at the EXETER HALL, STRAND, at half past Eight o'Clock in the Evening precisely, copiously illustrated by Specimens and Drawings,

AND IN THE FOLLOWING ORDER.

Monday, Feb. 13—LECTURE I. INTRODUCTORY. ON THE FUNERAL CEREMONIES OF DIFFERENT NATIONS. . . . . .

Thursday, Feb. 16—LECTURE II. EGYPTIAN TOMBS. Wisdom of the Egyptian—Antiquity of the Egyptian Mummies—extraordinary perfection of the art to be accounted for by referring to their theology—immortality of the soul—transmigration—Mummies as guests at feasts—as pledges for the loan of money—deposit of treasure in the tombs—various articles found—examples of several—earliest tombs—pyramids—Architecture and Sculpture of the Egyptians—Temple of Karnack—bears the name of Osirtesen I, contemporary of Joseph—Monotony of Egyptian buildings—colossal character—Head of Remeses the Great—Subjects represented in the temples and in the tombs—their variety—Egyptian Funeral Procession—ceremonies—instances of the denial of sepulture—examination of the characters of the dead—Assessors—Sacred Boat or Bari—Queens' Tombs—Tombs of the Valley of Dayr el Medeeneh—under the protection of the Goddes Athor—invention of the arch—Amunoph I. Catacombs and pits of Abd el Qoorneh and Drab Aboo Negga—Gate or Gates of the Kings—Royal Tombs—number known—Tomb of Osirei, commonly known as Belzoni's tomb—Alabaster sarcophagus—not likely to have been the receptacle of the body of a monarch—Some of the representations given in this tomb—Remeses III. The Harper's—illustration of Egyptian manners and customs—Tomb of Remeses V. Astronomical subjects—Tomb of Remeses VII—peculiar character of its sculptures—Tomb of Remeses II—the supposed Sesostris of the Greeks—Tomb of Pthah-Septhab—Western Valley—Tomb of Amunoph III—Tombs of Priests and Private Individuals.—Largest sepulchre hitherto discovered, that of Petamunap—Sale of tombs by the Priests—Catacombs—At Alexandria—Saccara-Silsillis—Gournou or Qoorna—Thebes—Mummy pits—Positions of the Mummies. Concluding remarks on the representation in the Tombs.

Monday, Feb. 20—LECTURE III. ON MUMMIES AND THE PROCESSES OF EMBALMING. Etymologies of the term Mummy—various applications of it—Natural Mummy of the Mountains—its scarcity and value—Mummy used in medicine—introduced by Elmagar—generally employed in the 15th and 16th centuries—cessation of the practice. EMBALMING—definition—art now unkown to the Egyptians—accounts given by Herodotus and Diodorus Siculus—variations in the modes—principal kinds—order pursued—peculiarities observed—substances employed—Mummies of the poor Nubians—Finest specimens of embalming—Destruction of Mummies in the search for treasure—Mummies of Thebes—Abydus—Memphis—The embalmers—the swathers—Extraction of the brain and other viscera—instruments employed—Account by Porphyry, supported by Plutarch—its improbability—Aromatics—Resinous substances—application of heat—Gilding of Mummies—Tongue plate—Body of Alexander furnished with a covering of gold chase work—Staining of nails with henna—Position of the Mummies—horizontal—arms crossed—Preservation of the hair—plaited—examples—rarity of the Mummies of Children—Mummy of a Fœtus—its case—Cessation of the practice of Embalming—Christian Mummies—insects found in the head of a Mummy—Medicaments employed in embalming—resinous and bituminous matter—asphaltum—Cedria—Balm—different kinds: of Judea—Syria—Egypt—Mecca—Colocynth—Myrrh—Aloes—Cedar dust—Natron—its analysis—Honey-Wax.

Thursday, Feb. 23—LECTURE IV. BANDAGES, CASES, AND SARCOPHAGI. Necklaces in contact with the body—Scarabœus—Rings—Enamelled eyes—Mouthpiece of the time of Remeses the Great—Ear-Rings—Silver nails—Deities of the Amenti—Bandages of different colours—Greco-Egyptian Mummies—covering of painted cloth—Bandages formed of linen—satisfactory proofs—researches of Dr. Ure and Mr. Thomson—different substances with which the bandages are coloured—Bitumen-Aloes-Goudron-Tannin-Sount-Carthamus—length of bandages—compresses—all applied wet—limbs sometimes separately bandaged—quantity of bandage varies greatly—Hieroglyphical characters impressed upon them—generally at the end—Articles of dress occasionally found—old linen, mended and darned—Hieratic and Enchorial and Greek inscriptions—Splendid Mummy from Memphis, in Signor D'Athanasi's collection—Amulets-leathern finger—ornaments in the Leeds Mummy—Garlands of flowers—Sandals—painted ones, with hieroglyphics—Symbolical representations under the head of some Mummies—Varnished bandages—Portrait over the face of a Mummy—idols and ornaments placed between the first and second layers of the bandages—great variety of necklaces—golden ornaments—quantity of gold in Egypt—metallic mirror, wooden cistern, alabaster vases &c. found in a mummy case—Funeral tablets—breast plates of king—The Genii of the Amenti—Idol found in the mummy of Horseisi—Bulbous roots—Rosemary—Eye of Osiris—Bracelets of gold and other materials—Diadem of gold and silver—Mosaic work—No money discovered in the tombs—Egyptian commerce—Rings of gold and silver—Medals struck under the Greeks, Romans and Arabs—First current coin of Egypt—Coin of Ptolemy in a Mummy—Leaden Medals affixed to a Greek Mummy.—Cases: The Cartonage—its manufacture beautifully painted—subject of the representations—Wooden coffin—sycamore—cedar—formed occasionally out of a single trunk—outer case—hard wood—inscriptions—Sarcophagi—Lapis azzlus—different materials and forms—ordinary shape—rose-coloured granite—marble—limestone—alabaster—Egyptian breccia—basalt—slate—baked-earth—wood. Sarcophagus of Amyrteus (Alexander's tomb) in the British Museum—"Lover's Fountain"—Alabaster Sarcophagus in Sir J. Sloan's Museum—Description of the Wooden Sarcophagus of Osiri.

Monday, Feb. 27—LECTURE V. ON THE PAPYRI, & ON THE HIEROGLYPHICAL LANGUAGE AND LITERATURE. Natural History of the Papyrus—its manufacture into paper—Egyptian literature—Rosetta stone—labours of De Sacy—Akerblad—Young—Salt—Champollion—Wilkinson—Burton, &c.—Hieroglyphical characters—Hieratic—Enchorial—Bilinguel MSS.—Papyri—their contents.

Thursday, March 2—LECTURE VI. SACRED ANIMALS—Worship of various Animals throughout Egypt—difficulty of the enquiry—Egyptian Mythology—Embalming of the Sacred Animals—Quadrupeds-Birds—Amphibious Animals—Fishes—Insects—Embalmed Vegetables.

Monday, March 6—LECTURE VII. RECAPITULATION—UNROLLING OF AN EGYPTIAN MUMMY.

Tickets of Admission to the Course, to which Ladies will be admitted to be had of the Lecturer, No. 8, Saville Row; Mr. Leigh Sotheby, Wellington Street, Strand; and at the Exeter Hall. Front Seats and Gallery. One Guinea. Back Seats, Half-a-Guinea.

Announcement of Lecture Series—1837

(Courtesy of the *Journal of Egyptian Archeology*)

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The Chemist Studies Ancient Embalming

Simon Mendelsohn, F.A.I.C.

Consulting Chemist, Cincinnati, Ohio

THE word "mummy" invariably implies an object that is typically Egyptian, and of an age that is shrouded in the mists of remotest antiquity.

While great numbers of so-called mummies have been discovered in such widely separated localities as Peru, Mexico, the Canaries, Alaska, Persia, India, and elsewhere, it is only the object of ancient Egyptian origin that has elicited the greatest degree of interest and curiosity, imagination and wonder. The mummies of ancient Egypt are inherently characterized by the esoteric mysticism that is typically indigenous to the East. The mummy also signifies an important fragment of one of the many exotic phases of the highly developed culture of a civilization now long extinct.

Other ancient civilizations, possibly of equal age and development, discovered in the course of archaeological exploration in recent years, also had their own peculiar funerary cults, but nowhere else were these at all comparable in degree and elegance to the attainments of the Egyptians. The climatic environment of Egypt is, also a vastly important factor underlying the apparent efficacy of the embalming art of these ancient craftsmen.

The science of Egyptology as a clearly defined phase of archaeology may be said to date back to 1798 at the time of Napoleon's invasion of Egypt. The savants that accompanied this expedition ransacked the ancient monuments, confiscated numerous mummies, papyri, etc., which were removed to Paris for subsequent study and leisurely appraisal. These savants, as an incident of military conquest, laid the foundation of the remarkable discoveries that have since come to light concerning the arts, crafts, language, and religious cults of early Egypt. The scientific investigation of mummified human remains, however, can definitely be traced to the exhaustive researches of Pettigrew,[1] whose epoch-making book, "The History of Egyptian Mummies" was published in London in 1834. It is known that the study of numerous mummy specimens had been previously undertaken by Rouelle as early as 1754, by Rouver in 1822, and Granville in 1825.[2]

THOMAS JOSEPH PETTIGREW
(1791-1865)
Courtesy of the Journal of Egyptian Archaeology.

Pettigrew, however, developed these investigations upon a purely scientific basis in contrast with the mere speculative archaeological conjectures propounded by his predecessors. That writer in his treatise, the first of its kind to be published in England, acknowledged due credit to the work of antecedent investigators, but from that point devoted his researches primarily to anatomical dissections and in lesser degree, to the cartonnages of mummies and their consecrated simulacra. The authoritative erudition of this work reflected the years of experience acquired from numerous autopsies and orginal researches conducted upon the many specimens placed at his disposal.

Pettigrew's interest in this phase of Egyptology was the result of his association with Belzoni in England in 1820. At that time the noted explorer enlisted the aid of Pettigrew as anatomist and surgeon in the autopsical examination of several mummies brought from Egypt. From this point there followed a career of many years devoted to investigations upon Egyptian mummified remains representative of all ages and dynasties.

These studies in their anatomical and anthropological aspects, have in recent years been extended by the authoritative work of Ruffer, Dawson, G. Elliott Smith, and others. Aside from the purely anatomical phases encountered in these investigations, there have always been numerous features attended by obscurity which recently has been partially dispelled through the active collaboration of workers in other fields of science, such as the application of precise methods of technical analysis now at the disposal of modern chemistry.

The advent of the chemist into the realm of the archaeologist, and into Egyptology in particular, must be attributed to the highly specialized fundamental procedures developed by Derry, Reutter, Bailey, and especially Lucas. All of these workers must be regarded as pioneers in a field so new and extensive that at best only pre-

liminary results have till now been attained.

The work of these investigators in connection with their studies of the mummified remains found in Egypt, has been devoted chiefly to the identification of a great variety of materials, organic and inorganic, that were originally utilized in the embalming processes. These researches are rendered more difficult in view of the empirical choice of the numerous media that were available to the ancient embalmers.

Selection of materials for this purpose was governed by several controlling factors as, (1) the status of the deceased; (2) the type of embalmment applied, and (3) local environment and practice. All of these features in turn, were subject to customs coeval with the vogue established during the various dynastic periods. Processes are also known to have been modified extemporaneously to meet the requirements imposed by special occasion.

In numerous examples, certain of the materials originally utilized have long since sustained marked physical and chemical alterations due to their mode of usage, as well as to the many factors operating during the millenia since these bodies have been mummified.

The exact date of the origin of Egyptian mummification is not known, although there is some presumptive evidence to indicate the practice may probably have been in use as early as the 2nd. dynasty (ca. 3400—2980 B.C.). In tombs of that period which were explored by Quibbel[3] at Saqquara, several bodies were found that had been elaborately bandaged with each limb wrapped separately. These specimens, however, were not mummies, inasmuch as the wrappings enclosed only skeletal remains. The bodies, long ago disintegrated, had doubtlessly been prepared during an era that witnessed the initial experimental stages in the art of mummification. Coming to the time of the 4th. dynasty (2900—2750 B.C.), there has been discovered a canopic jar that had originally accompanied the mummy of Hetepheres, the mother of Cheops who is best known as the builder of the mighty pyramid at Gizeh. This canopic receptacle, unearthed several years ago, still contained several packets of dried, shrunken matter that appeared to be portions of visceral remains that had been preserved in natron.[4]

The earliest known actual mummy is one discovered in 1892 by Prof. Flinders Petrie near the pyramid of Medum, and which has since reposed in the museum of the Royal College of Surgeons in London. This specimen was at first thought to be contemporaneous with the Pyramid Age (ca. 2900—2625 B.C.) until Reisner and others, in studies of later data concluded the era of the 5th. dynasty (ca. 2750—2625 B.C.) as being the most probable.

According to Wiedemann,[5] the entire process of Egyptian embalmment is briefly described in the Rhind Papyrus, edited by Birch (London 1863) and independently by Brugsch (Leipzig 1865). Nevertheless the three methods of embalming that were in vogue are invariably accepted on the basis of the records of Herodotus (ca. 484—425 B.C.) who in turn was followed by Diodorus Siculus who visited Egypt about four centuries later.[6] Mummification according to fashion constituted the most important obligation imposed upon the bereaved. The corpse was given into the care of the embalmers who conducted their work under stringent priestly supervision to assure the proper rituals being followed in accord with long established mortuary customs. In the case of noble personages or others of exalted social or political status, the most expensive embalming technic was applied.

Briefly, the internal or more corruptible parts of the body were removed; the entrails through a flank incision[a] and the brain extracted through the nostrils. The eviscerated corpse was then treated with natron for an appointed period after which the skull and body cavities were filled with wadded bandages that had been impregnated with resins and other preservative media. This was followed by immersion in, or liberal applications of, molten bituminous materials. Washing of the body with palm wine, anointing with fragrant ointments, etc., were important steps in the mortuary rituals. The body was finally swathed in bandages which, adhering to the hot resinous or bitumen-like materials covering the skin, provided a rigid and impervious shroud. Seventy days were supposedly required to complete the entire embalmment,[7] after which the body was placed into an ornate coffin and returned to the bereaved.

A variety of amulets was placed within and upon the body; those placed externally, were secured in position by means of the bandages. By virtue of their supposedly mystic potencies, some of these talismans were intended to assure preservation of the body throughout eternity. Amulets were frequently carved from carnelian and other gem materials; scarabaei, miniature glazed-ware simulacra and figures of divinities also symbolized the invocation of immortality on behalf of the deceased.

The substances, preservative and accessory, to be here described, include the most essential or basic media that are definitely known to have been in use, since these are the ones invariably encountered in the chemical examination of mummified remains.

(a) Noteworthy exceptions to this practice have been noted. A few lesser known mummies have been discovered having no embalming incision and still retaining their internal organs. An interesting series of 11th. dynasty (ca. 2160-1788 B.C.) princesses was found interred beneath a temple of Mentuhotep at Deir-El-Bahari; these mummies provide an exceptional instance of Egyptian embalming wherein all of the viscera were retained intact and in situ.

Many of the substances may, of course, be present in more than one form, depending upon the sources of supply, mode of usage, or particular form or type that may have been required to meet a special purpose. In addition to these more commonly used materials, there were still others tentatively chosen for their known or suspected preservative efficacy.

Ancient and modern literature describing the Egyptian art of mummification, abounds with references to the universal application of bitumen to insure preservation of the dead. This substance or others similar, were, it is surmised, applied to the dead either by pouring the molten material over the corpse and then over the wrappings, or by total immersion into the hot liquid. Bitumen alleged to have been obtained from the Dead Sea, is mentioned in the early writings of Diodorus[8] and Strabo.[9] Herodotus,[10] in his detailed description of the Egyptian mummifying processes, while frequently referring to bitumen, does not, however, record its use as an embalming agent.

Dioscorides,[11] the ancient Greek physician, discussed the medicinal virtues of a black substance known by the Latin name of mumia, and found exuding from the ground in certain places. From that time to the present, the term "mummy" so derived, has been used to denote this type of embalmment in which bituminous or related substances were employed for preservative purposes. From the earliest reference to bitumen in Greek and Roman literature, to within the modern period, the typical asphaltum of commerce has been the solid bitumen found on the shores of the Dead Sea. While deposits of very pure asphaltum occur in Egypt, there have been no reports of other sources of this substance elsewhere on the African continent.[12]

Bitumen was frequently encountered in those lands mentioned in the Bible, and embracing the valley of the Tigris and Euphrates, the tablelands of Mesopotamia, and the valley of the Jordan. This substance, occurring frequently along the shores of the Dead Sea was anciently gathered and sold in the caravan trade passing through the lands of Moab and Petrea and so into Egypt. The terms bitumen and asphaltum appear frequently to have been used with different meanings, interchangeably, or synonymously. Asphaltum as obtained on the shores of the Dead Sea has long been technically recognized as the solidified form of the material included by the generic term of bitumen.[12]

Natural bitumens are composed chiefly of unsaturated hydrocarbons and their sulphur derivatives in association with small amounts of nitrogenous constituents. Asphalt may, therefore, for all intents and purposes, be defined as any hard bitumen consisting essentially of unsaturated hydrocarbons and their derivatives,

and which on the application of heat, melts to form a viscous liquid. Bitumens are distinguished by the comparatively large amount of sulphur they contain, and it is to its presence that many of the important properties, and possibly in part, the origin of this form of the substance can be attributed. According to Richardson, the sulphur content of the mineral pitches from various sources throughout the world varies from 1.2 to 9.7 per cent.

Ultimate Composition of an Egyptian Type of Bitumen

(Richardson, J. Soc. Chem. Ind. xvii, 29, 1898)

Sulphur	Carbon	Hydrogen	Nitrogen	Total
8.52	80.87	10.42	0.19	100.00

Lucas,[13] despite the repeated assertions even of modern writers, long ago questioned the truth of the old records in regard to the use of bituminous materials as a preservative agent in Egyptian mortuary practice. That writer, after rigorous investigations concluded definitely that bitumen if ever used for such purposes, had certainly never been utilized until the advent of the Ptolemaic period (332—30 B.C.). This opinion, subsequently confirmed by Ruffer[14] whose experience included examination of Egyptian bodies from prehistoric to Coptic times, seems now to be generally accepted. Dawson[15] in agreement with these conclusions, also contends that mineral pitch (bitumen) had not been used as a preservative until the Graeco-Roman era if at all, and if so employed, was by no means the universal embalming material so frequently cited by modern writers.[16]

Misconceptions in the attempts to identify the pitch-like substances arise from the facts that, (1) the resinous material invariably encountered in the later mummies, is black and resembles bitumen, and (2) that no systematic or even tentative means of differentiation had been established through the means afforded by precise chemical analysis.

Spielman[17] in efforts to verify or disprove the presence of bitumen in ancient mummy fragments, exposed these to ultra-violet radiation, as well as inaugurating spectroscopic studies of the mineral portions obtained in the incineration of such specimens. The first procedure yielded inconclusive data, while the second offered only some degree of presumptive evidence of the presence of bitumen. This substance, if derived from the Dead Sea locality, would invariably be characterized by the presence of vanadium, nickel, and molybdenum. Yet the bituminous materials obtained from numerous mummies failed in every case to reveal the presence of these specific trace elements. It must, therefore, be inferred that this material

either is not true bitumen, or that it must have been obtained from sources other than the Dead Sea region.

In view of a lack of conclusive results in these investigations. Spielman[17] suggested the possibility of wood pitch having been used instead of bitumen. This presumption tends to complicate matters even more by introducing another alternative, but Spielman's suggestion is based on results of further studies with additional materials. A number of specimens of ancient embalming media, chiefly from Ptolemaic mummies and frequently from the inside of the skulls of these, have been examined by Lucas,[18] who seems inclined to believe that wood pitch may actually have been used for these purposes. It is of interest to note in this connection, that specimens of North European wood pitch uniformly failed to reveal any traces of the three elements in question.

According to Spielman,[19] the bitumen-like substances used in the ancient practice of embalming might also have been mixtures consisting predominantly of wood pitch together with relatively insignificant proportions of a bitumen. This might account for the failure of spectroscopic examinations to reveal even the slightest traces of the three index elements and ultraviolet exposures to have indicated the substances to correspond with a group occupying an intermediate position between the bitumens and natural resins. Summarily, the question of bitumen having been used in Egyptian embalming, is still open to confirmative evidence rather than to categorical inferences for its final disposition.

Assuming the Egyptians actually to have utilized molten bitumen as an embalming agent, it seems reasonable to believe that the constituent hydrocarbons of this substance might have been responsible for the preservative effects attained where bitumen appears to have been used. It is equally tenable to assume the preservative efficacy of the molten bitumen to reside in its sulphur content. Sulphurous vapors, being definitely known to contribute a singular degree of preservation to animal tissue, may have been a contributing factor toward the initial phase of chemical mummification where the process appears to have been effected with a bituminous material. Whatever media, however, may have afforded initial chemical preservation, it is equally certain that dehydration and climate were vastly important agencies in the well nigh perfect specimens of Egyptian embalming.

Saline media played an important role in the ancient mummification processes. Bodies were, according to Herodotus, treated with natron (or natrun), a naturally occurring mixture of sodium carbonate (Na_2CO_3) and bicarbonate ($NaHCO_3$) in varying proportions. Natron consists essentially of these two salts, but is in-

Typical Analyses of Natron[20]

	Modern Deposits Per cent			From Tombs Per cent		
Sodium carbonate, Na_2CO_3	38.2	28.9	58.6	16.1	36.9	9.2
" bicarbonate, $NaHCO_3$	32.4	9.9	14.3	10.7	8.3	6.3
" chloride, $NaCl$	6.7	26.8	7.4	25.2	9.9	39.3
" sulphate, Na_2SO_4	2.3	27.4	1.3	27.8	33.9	13.2
Moisture, free & combined, H_2O	16.5	6.9	4.3	8.7	5.6	6.8
Insoluble matter	3.9	0.1	14.1	11.5	5.4	25.2

To yield 100 per cent

variably associated with common salt ($NaCl$), sodium sulphate (Na_2SO_4), moisture and insoluble matters in lesser degrees.

Modern writers for years past, have assumed the cadavers to have been immersed up to the neck in natron baths for periods of forty to seventy days, as the initial treatment required to induce subsequent preservation. Lucas,[20] however, contends that this erroneous conception arose through a faulty translation of the account of Herodotus, and is definitely inclined to the idea of the natron having been used in its solid state. Exceptions have been conceded in the means that may have been adopted in preserving the viscera, but complete coverage of a corpse with natron in powdered form would undoubtedly have yielded the desired effects. In view of the singular dessicant properties of the saline mixture, the body would gradually become dehydrated with very little decomposition and putrescent odor.

It has also been frequently asserted that the complete removal of epidermis was an integral part of the ancient embalming procedure, and supposedly one of the objectives to be attained by treatment of the dead with natron for a period of many days. Conversely the fact that the bodies of mummies are frequently found denuded of epidermis, should not be accepted as proof of saline immersion,[21] since putrefaction alone may have been the causative factor. (This phenomenon is denoted as "skin-slip" in the terminology of the modern embalmer.) In other instances, the epidermis may originally have become seared and firmly incorporated with the hot pitch or resinous substances over which the numerous and lengthy bandages were placed. In such cases, the dried epidermis adherent to the bandages would be peeled off in shredded fragments or be reduced to a dry power, and in either instance, therefore, not recognized when viewed ages later.

Spices also, are definitely known to have been utilized by the Egyptian embalmers. Here again, is encountered

the great difficulty in dealing with ancient materials, inasmuch as not infrequently the same name has been applied to different substances at different periods. For example, the cassia of the ancients probably corresponds to the cinnamon in common modern usage and vice versa. Cassia and cinnamon are quite similar, both being representative of a variety of laurel, The first, however, is, as a rule, characterized by a greater degree of pungency and astringency, but is less delicate in flavor than cinnamon. In many instances where these spices were employed by the ancients, their use was not confined to the barks, but to the flower tops, twigs, and wood as well.

It is of interest to note that Diodorus specified cinnamon, and Herodotus, cassia, as having been used in the mummification processes, but it is probable that both writers referred to the same thing. Conversely, in spite of the sharp distinctions drawn by the ancients, as between cassia and cinnamon, there exists an alternate but remote possibility that their cinnamon may have been of Chinese origin, and hence a type of cassia. The latter has been quoted as being included in the oldest known Chinese herbal dating from ca. 2500 B.C., while a spice supposedly cassia is alleged to have been imported into Egypt as early as the 17th. century B.C.[22] The fascinating fragrance of cinnamon was included, however, in certain types of perfumeries and probably incense which contained aloes and myrrh. A composition of this short in mentioned Bible records[23] and was undoubtedly known to the Egyptians of the period embraced in these chronicles.

It is a matter of interest that modern research has definitely proven cinnamon even in comparatively low concentrations, by virtue of its content of cinnamic aldehyde, to be capable of inhibiting bacterial growth over reasonable periods. Trace of aromatic gums and resins in combination with spices have been found interspersed between the skin and bandages of several mummies, and in one case, the powdered substance treated with alcohol or water, afforded a pronounced odor of myrrh, upon exposure to heat.

Pettigrew[24] cites an example quoted by Osburn[25] to the effect that in one mummy specimen the visceral cavity had merely been filled with what appeared to be cedar dust, cassia, and earthy matter.

Natron in admixture with certain unidentified gum-resins and possibly spices, probably provided a form of incense similar to that which was discovered in the tomb of Tutankhamun.

Beeswax also is cited as having been utilized to some extent in embalming, for covering the ears, eyes, nose, and mouth, and other parts of the body, and to seal the incision through which the viscera had been removed.[26] [27] [28] Eleven specimens of beeswax removed from mummies were examined

by Lucas, who reported the melting points of the material as ranging from 63°—70° C.; this factor for the modern wax varies from 60.5°—64°+C. The samples of ancient wax submitted to Lucas were light in color, and somewhat friable on the surface, but had apparently sustained no marked chemical alteration.[26]

The so-called "oil of cedar" is another ancient preservative medium in the records of both Herodotus and Diodorus, yet these writers differ in their accounts regarding the mode of usage of the oil they designated as having been so utilized. Diodorus referred to the oil as having been used for anointing the dead, while his predecessor mentioned it as having been used as an injection to effect visceral dissolution. In view of the fact that a fixed oil from any coniferous tree is cited as having been unknown to the ancient Egyptians, it was suggested that the so-called "oil of Cedar" of the old records may have been a product of juniper.[26] If used as an injection, this medium may have been either impure oil of turpentine, especially imported, or else a mixture of this with pyroligneous acid and wood tar. Conversely, if employed for anointing the dead, the material might also have been the volatile oil of juniper in a fixed-oil menstruum, but at best there exists no Egyptian evidence of the use of either of these media.[26]

Cedar juice (cedri succus) was mentioned by Pliny[29] as having been known to the ancient Egyptians; this was a natural resinous exudation of some coniferous tree, probably never the cedar, and most likely, the juniper. Of this there is some tentative evidence in several examples of Egyptian embalming. Cedrium, also cited by Pliny as a preservative material in use by the ancient, was defined by that writer as pyroligneous acid in admixture with oil of turpentine and wood tar. It is also possible that the term "cedrium" may have implied a wood tar alone, which incidentally, is also presumed to have been employed in the mortuary crafts.[30]

Herodotus mentioned gum as a staple material frequently used in preference to glue, resinous or bituminous matters, for basting together the linen bandages in which mummies were swathed after embalming. The gum referred to, was no doubt, that obtained from various species of acacia[31] which were abundant in Egypt even in ancient times, and definitely identified by Reutter[32] and Lucas.[32] The profusion of this plant throughout Egypt and contiguous localities was such that acacia came to be known among the ancients as "gum of Canaan" or "gum of Egypt".[33] Acacia in combination with myrrh and gum-resins frequently constituted the highly prized incense and perfumeries that formed so great a part of all religious ceremonials.

Henna while devoid of any known

preservative properties is nevertheless frequently cited as having been used for cosmetic purposes in embalming. An extract of henna has since time immemorial, been in use in the Orient, for application to the palms of the hands, soles of the feet, and the nails of fingers and toes as well. G. Elliott Smith(32) described the hair of an 18th. dynasty (1580—1350 B.C.) mummy as having been dyed a brilliant reddish color suggestive of the use of henna.

The so-called precious ointments asserted to have been used for anointing the dead, in the course of embalming rituals, are mentioned only in the account of Diodorus.

The identity of these preparations is not specified, and to date there has been no evidence available from the mummies whereby the composition of such ointments can be ascertained. Such inunctions may have been composed of quite a variety of fragrant materials, e.g., storax, gurjun balsam, aloes, frankincense, myrrh, "cedar oil", olibanum, tolu, amber, cloves, etc., incorporated within ox-fat, olive oil, or other oleaginous bases in combination with wood pitch or some resinous composition. Tschirch(34) identified mastic and alleporesin, in addition to many of the above, in embalmed remains from both ancient Egypt and Carthage. Incidentally, according to that writer, the Carthaginians frequently employed thyme and mint with other embalming materials intended to impart fragrance to the mummy. Olive oil seems to have been utilized for a great variety of purposes other than for the preparation of aromatic ointments, and is mentioned in an ancient record as early as the 1st. century A.D.(35)

Cosmetic materials which may have been used as embalming inunctions, obtained from the tomb of Tutankhamun, were examined by Plenderleith(36) and found to consist of odoriferous resins and pitch. Tests have thus far failed to indicate conclusively as to whether the latter component had been of mineral or vegetable origin. Another cosmetic preparation submitted to Lucas(26) for analysis, yielded 46 per cent of fatty matter, possibly the acid anhydrides of the original fat bases; 19 per cent of a brown resin, and a brittle, black organic residue that eluded identification.

Among the fixed oils other than olive definitely known to the ancient Egyptians, and which might have entered into the composition of ointments for use in embalming procedures, were the following: almond, castor, benne, balanos, radish, sesame, colocynth, linseed, and safflower. To date, the sole analyses of fatty materials from ancient Egyptian sources are those published by Ure,(37) Friedal,(38) McArthur,(39) Chapman & Plenderleith,(40) Thomas,(41) and Banks & Hilditch.(42)

Palm wine is also mentioned by both Herodotus and Diodorus as

having been used for the cleansing of eviscerated cadavers prior to actual embalming. Despite the specific nature and properties of the great variety of preservatives and accessories thus far cited, it is readily evident that dessication of the bodies was the major principle of the Egyptian mummification processes. Summarily, the most important phases involved in the ancient embalmments were the removal of readily decomposable parts of the cadaver, then the treatment with saline media, followed by exposure to great heat which might have been effected through the application of hot, molten pitch, resins, or both. In most instances, defective embalming would subsequently be compensated by the natural preservative effects of the extreme heat and dryness of the Egyptian climate.

It is for this reason, chiefly, that the ancient embalming technic, or more properly, the mummification processes, should be regarded as being the result of physical agencies rather than chemical. This is at once evident on appreciation of the means adopted intentionally or otherwise, by the ancient embalmers for inducing dehydration of the cadaver.

The physical aspects of the entire mummification technic accounts for the retention of many of the original proximate components of normally complex biological structure of body tissues after thorough preservation by embalming. The physical and chemical effects of the varieties of preservative materials, utilized in the several methods of ancient embalming, are definitely manifested in the appearance and condition of mummies despite the lapse of millennia. Other controlling factors, such as the age of the specimen, the duration of entombment, etc., exert modifying influences that in certain instances may erroneously be attributed to the processes originally induced at the time of embalmment.

The table below affords a comparison of the results attained in the various stages of development and subsequent decline of the Egyptian embalming art from the 11th. to the 21st. dynasties throughout a period of about ten centuries.

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Dynasty	Period	Condition of Mummies
11th.	ca. 2160 B.C.	Yellowish and brittle; disintegrate rapidly on exposure; poorly prepared.
12th.	ca. 1788 B.C.	Black; skin is thoroughly dessicated.

13th.-17th.	ca. 1788-1580 B.C.	Poorly prepared; perish readily on exposure.
18th.-21st.	ca. 1350-1090 B.C.	Black and dessicated to such degree that disintegration may occur at the slightest touch.

There are, however, numerous noteworthy exceptions to these, as for example, in the case of the mummies of Seti I (ca. 1320 B.C.) and his son Rameses ii (ca. 1300 B.C.). These specimens now reposing in the Cairo Museum, are usually regarded as among the finest types representative of the era of the 18th. to the 21st. dynasties.

The following data according to Huebner,[(43)] reveals some of the inorganic chemical alterations in the tissues of two particular specimens of Egyptian mummies, over long periods of time.

	Specimen No. 1 Per cent	Specimen No. 2 Per cent	Composition of Normal Muscle for Comparison* Per cent
Alumina, Al_2O_3	0.90	0.13	...
Carbon dioxide, CO_2	Traces	2.64	...
Chlorine, Cl	1.89	0.22	0.27
Iron oxide, Fe_2O_3	0.27	0.15	0.02
Lime, CaO	0.90	4.83	0.03
Phosphoric acid, P_2O_5	0.42	1.57	1.82
Potash, K_2O	0.77	1.21	1.75
Silica, SiO_2	5.80	0.90	...
Soda, Na_2O	9.03	0.24	0.30
Sulphuric acid, SO_3	2.99	1.91	2.20**

*Bunge, Zeitschr. physiol. Chem. ix, 61.
**This represents the amount of SO_3 that would be formed by the complete oxidation of all of the sulfur in the muscle.

The dried tissues of specimen No. 1 were fairly intact, while specimen No. 2 had become disintegrated to a fine dust.

Analysis of Mummy Dust from Specimen No. 2[43]

	Per cent
Loss at 100° C. (air oven)	5.00
Volatile matter; dry basis	65.83*
Fixed carbon	18.14
Ash (carbonated)	11.03
Alumina, Al_2O_3	0.53
Calcium carbonate, $CaCO_3$	5.08**
Iron oxide, Fe_2O_3	0.13
Magnesium carbonate, $MgCO_3$	0.65***
Potassium carbonate, K_2CO_3	1.61
Potassium sulphate, K_2SO_4	1.15
Sodium chloride, NaCl	0.53
Silica, SiO_2	0.87

*Portion soluble in carbon disulphide = 8.43 per cent of the volatile matter.
**Equivalent to 2.84 per cent of lime (CaO)
***Equivalent to 0.31 per cent of magnesia (MgO)

Huebner suggested that specimen No. 1 might have been embalmed by a treatment with salt, and No. 2 with lime, in view of the extremely high percentages of these compounds or their residues found to exist in the respective specimens. The high alumina content might be attributed to the alum that had been employed as a mordant for the colors with which the winding sheet and bandages had been dyed. Considering the fact that the dried dust of these disintegrated tissues had been grossly contaminated with finely subdivided particles of textile material lends credence to this means of accounting for the excess of alumina which may well have come from this source.

Several other fairly recent examinations of Egyptian mummies from both chemical and biochemical aspect, offord considerable data of scientific interest. The biochemical phases encountered in these studies indicate that post-mortem transformations in the cadaveric tissue were promptly arrested by what appear to be purely physical agencies rather strictly chemical. Schmidt[44] in examinations of dried mummy tissues, found all of these to contain fatty acids. Tissues of one particular specimen, some 1500 years old, yielded, for example, chiefly the higher fatty acids of which 40 per cent proved to be oleic acid. Mummies of greater age, e.g., 3000 years old, also contained several of the higher acids in addition to certain of the volatile ones, chiefly butyric and

caproic. There is, of course, the possibility that the fatty substances normally residing in tissues, may have been augmented by the absorption and retention of fatty ointments which had penetrated the skin by inunctions prior to treatment of the body with hot resinous or bituminous substances.

Abderhalden and Brahm,[45] studied the condition of protein residues in dessicated muscular tissue substance of Egyptian mummies and identified the following amino-acids removed from neck muscle: glycine, alanine, leucine, glutamic acid, and phenylalanine. The preservation of these proximate components of normal protein would indicate definitely, to some extent at least, that the embalming processes were more physical rather than chemical. This is substantiated by the fact that proteolytic cellular enzyme activity had not become abated after 3000 years, in the case of these specimens. In this instance, the precipitin reaction and glucolytic phenomena were observed despite the passage of millennia since embalmment had been effected.[46]

Sehrt[47] reported findings of a parallel order in studies of tissue substances from mummies. In addition to the precipitin reaction, the tissues in contact with pancreatic enzymes sustained glucolysis, and yielded a positive oxidase reaction. Portions of dessicated mummy tissue removed from a specimen in the Vatican Museum, were submitted to chemical investigation by Tulli,[48] whose results, however, afforded no innovational data. In this case, the tissue reaction was cited as being neutral; tests for carbonates, arsenic, and heavy metals proved negative. Alcoholic extractions of the dried tissues yielded substantial resinous residues of distinct balsamic odor. Tulli concluded these data merely to confirm the ancient records of natural balsams having been used as embalming agents by the ancients.

Wagenaar,[49] several years ago, reported the results of chemical examination of tissues and swathings of the mummy of Khonsu Hoptep, an Egyptian priest of the 18th. dynasty (ca. 1350 B.C.) after forty years of partial exposure. A reddish-brown substance removed from the intercostal spaces is cited to have yielded hematin chloride, hemochromogen, hematoporphyrin; the material also contained iron and nitrogen in precisely the same ratio as in fresh blood. Microscopic examination disclosed the presence of crystalline potassium nitrate and salt. Extractions of a brown resinous substance with which the swathings had originally been impregnated, yielded catalase (and probably protease), dextrose, levulose, oxalic acid, citric acid and some calcium salts.

These data in view of the prevalence and historic importance of the fig tree in ancient Egypt, suggested to the analyst, the probability of an astringent extract of ficus sycamorus having been the principle preservative

agent utilized in embalming the bodies of important personages.

The foregoing provides an idea of the multiplicity of embalming media utilized by the Egyptians. Materials such as Nile mud, and even onions were used occasionally for the packing of cavities, but as a rule, items of this sort were employed at later dates when the decline of the embalmer's art had become conspicuously evident.

The established commerce in embalming materials, and mortuary supplies in general, doubtlessly represented a highly lucrative phase in the economic structure of ancient Egypt. Many of these items were, through necessity, imported by caravan traffic, but the most important of the embalming media were actually available within the immediate confines of the Nile valley.

The ancient Egyptians strove for preservation of their dead for reasons that were solely religious, and these, while serving as an incentive to perfection, nevertheless, relegated the esthetic aspects of the embalming art to oblivion. Despite this circumstance, the embalmers of remotest antiquity developed an unprecedented achievement deserving of the highest praise in an art, that for the most part has produced results that have survived these many centuries.

(1) Dawson, W. R., Journ. Egyptian Archaeology, Nov. 1934 vol. xx pts. 3 & 4, Memoirs of Thos. Joseph Pettigrew F. R. S. Medical Life Press, N. Y. (1931)
(2) An Essay of Egyptian Mummies With Observations On The Art Of Embalming Among The Ancient Egyptians; London (1825) 1-50 pls. 18-23
(3) Excavations At Saqquara (1912-14) pp. 11-19-28-32 pl xxiv (3) Reisner, G. A., Bulletin of the Museum of Fine Arts, Boston (1928) xxvi No. 157
(4) Smith, G. Elliott & Dawson, W. R.,Egyptian Mummies, N. Y. (1924)
(5) Ancient Egyptian Doctrine of Immortality, London (1895)
(6) Dawson, W. R., "Making A Mummy" Journ. Egyptian Archaeology xiii (1927) Smith, G. Elliott, & Dawson, W. R., ibid.
Mendelsohn, S., Embalming Fluids, N. Y. (1940) part i
Ciba Symposia (N.Y.) May 1944 pp. 1796-7
(7) Smith, G. Elliott & Dawson, W. R., ibid.
(8) Bk. xix, 6
(9) Bk. xvi, 45
(10) Euterpe
(11) De Materia Medica Bk. 1 Chap. 100
(12) Peckham, S. F., Solid Bitumens, Their Physical & Chemical Properties and Analysis, N. Y. (1909)
(13) Survey of Nubia for 1907-8 (1910) ii
Preservative Materials Used By The Ancient Egyptians In Embalming, London (1911)
Journ. Egyptian Archaeology, i (1904)
Ancient Egyptian Materials & Industries, London (1926)
(14) "Histological Studies On Egyptian Mummies", Memoirs de l' Inst. Egyptian vi fasc. 3 (1911)
(15) "Making A Mummy" Journ. Egyptian Archaeology xiii (1927)
(16) Reutter, L., (1913) quoted by Lucas, A., Ancient Egyptian Materials & Industries. London (1926); 2nd. ed. London (1934)
(17) Journ. Egyptian Archaeology, xviii (1932) pp. 177-80

(18) Preservative Materials Used By The Ancient Egyptians in Embalming, London (1911)
(19) ibid. (20) ibid.
(21) Ruffer. Cairo Sci. Journ. 9: 34 (1917)
(22) Redgrove, H. S., Spices & Condiments, London (1933)
(23) Bk. of Proverbs, chap. vii verse 7
(24) History of Egyptian Mummies, London (1834)
(25) An Account Of An Egyptian Mummy Presented To The Museum Of Leeds Phil. & Lit. Soc., London (1828)
(26) Lucas, A., Ancient Egyptian Materials & Industries, London (1926)
(27) Smith, G. Elliott & Dawson, W. R., Egyptian Mummies, N. Y. (1924)
(28) Lucas, A., Preservative Materials Used By The Ancient Egyptians in Embalming, London (1911)
(29) Bk. xxiv, 2
(30) Bk. xvi, 21
(31) Pliny, Bk. xiii, 20; xxiv, 67
(32) Smith, G. Elliott, "The Royal Mummies"; Catalog Of The Cairo Museum
(33) Lloyd, J. U., Origin & History Of The Pharmacopoeial Vegetable Drugs vol. i, Cincinnati (1921)
(34) Arch. Pharm. 150: 170 (1912)
(35) Grenfell, B. P., & Hunt, A. S., The Amherst Papyri, ii 150; also mentioned by Theophrastus, Enquiry Into Plants, Bk. iv, 2, 9, and Strabo, Bk. xvii, 1,35; also Pliny Bk. xv. 4
(36) The Tomb Of Tutank-Amen, Appendix v, pp. 215-16, ii
(37) Quoted by Wilkinson, J. G., The Ancient Egyptians, London (1878) ii, p. 401
(38) Lucas, A., Ancient Egyptian Materials & Industries, London (1926)
(39) "Examination Of An Ancient Egyptian Cosmetic" Journ. Chemical Soc., 2614-19 (1926); see also Note (36)
(40) Ibid. (41) Ibid.
(42) "A note On The Composition Of Some Fatty Materials Found In Ancient Egyptian Tombs" Analyst (1933) pp. 265-9
(43) "The Tomb Of Two Brothers" Handbk. of the Manchester Museum, London (1910)
(44) Chem. Ztg. 32: 769 (1908)
(45) Zeitschr. physiol. Chem. 61: 419 (1910)
(46) Biochem. Zeitschr. 226: 237 (1930); Chem. Abstr. 25: 124 (1931)
(47) Arch. exptl. Path. Pharmakol. 143: 35 (1929)
(48) Chem. Abstr. 24: 383 (1930)
(49) Chem. Abstr. 24: 5310 (1930)

Accessory Bibliography

Blackman, A. M., "Some Notes On The Ancient Egyptian Practice Of Washing The Dead," Journ. Egyptian Archaeology (1918), pp. 118-20.

Netolitzky, F., "Relation Of Asphalt And Ichthyol To Mummification," Pharm. Zentralb. 68:2 (1927).

Schmidt, W. A., "Chemical & Biochemical Examination Of Egyptian Mummies, Including Some Observations On The Chemistry Of The Embalming Process Of The Ancient Egyptians," Cairo Sci. Journ., April 1908, p. 147.

Smith, G. Elliott, "The Wonders Of The Mummy," pp. 327-38 in Wonders Of The Past, edited by Hammerton, J. A., London (1924), vol. 2.

Stadlinger, H., "Ancient & Modern Mummification," Pharm. Zentralb. 69:483 (1928).

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Patent Aplications Increasing

R. J. Dearborn, chairman of the Patents Committee of the National Association of Manufacturers, recently stated that the marked increase in the number of applications for patents being filed in the Patent Office indicates that American inventors are endeavoring to create many new products for the postwar era.

Patent Office statistics show that applications for patents for the first four months of 1945 were about 20 per cent above the similar period for last year. The low in applications for about thirty years came in 1943, when 45,535 were received. In 1944, the number rose to 54,232, and now is running at the rate of about 62,000 a year.

David Gordon with Foster D. Snell, Inc.

Foster D. Snell, Inc., Brooklyn, New York, announces that David Gordon, formerly chief engineer for the Interchemical Corporation, has been appointed director of Engineering.

New Graduate Fellowship at M. I. T.

The National Research Corporation, Boston, Mass., has donated an initial amount of $2,500 to establish a graduate fellowship in high vacuum research at the Massachusetts Institute of Technology.

Arthur M. Buswell, F.A.I.C., has returned to Illinois as chief of the State Water Survey and professor of chemistry at the University of Illinois. Recently he served as major in the U.S. Army at the Medical Research Laboratory, Edgewood Arsenal, Maryland, and is still civilian consultant to the Chemical Warfare Service.

E. L. Luaces, F.A.I.C., has been elected a member of the Board of Managers of the Dayton, Ohio Branch, American Electroplaters' Society.

Are You Going To Read A Paper?

From the viewpoint of the person at whom ideas are aimed, there is a distinct difference between the oral and written methods of expression of thought. Often the written word when read aloud, despite the listener's avowed interest in the subject matter, induces a somnolent state. And an exciting bit of oratory reproduced in cold print can be awfully dull reading.

These considerations need to be kept in mind by those who prepare papers for presentation at technical meetings. Too frequently engineers, when called upon to give a talk on a technical subject, present their paper as they would have it appear in print. All the rules of effective oratory are disregarded, and because of the ineffectiveness of the presentation, the audience loses an idea here and an idea there, until so fully confused that there is nothing left to do but relax.

To all those who will in the future be asked to read a technical paper, this plea is made: Do not read the same paper you want published! Prepare another intended solely for oral delivery.

—Excerpt from an editorial in *Engineering News-Record*

A firm in Algiers announces that it is prepared to export calcium fluoride to the United States.

Columbia School of Engineering Awards Degree to Woman

The first B.S. degree in chemical engineering ever awarded to a woman at the School of Engineering of Columbia University, was bestowed on Eleanor Leland, of Port Washington, New York, at the June graduation exercises. Miss Leland is interested in power plant work in the field of organic chemistry

Durand Awarded Carty Medal

The Carty Gold Medal of the National Academy of Science was presented to Dr. William F. Durand, research engineer of Stanford University. The Medal carries a cash award of $2,500, and is awarded biennially to a person who has made noteworthy and distinguished contributions to science. Dr. Durand is now serving as chairman of the division of engineering and industrial research of the National Research Council, and is a member of the National Advisory Committee for Aeronautics.

Lt. Commander Max Trumper, U. S. N. R., F. A. I. C., is coauthor with Abraham Cantarow of *Lead Poisoning,* recently published by Williams and Wilkins.

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To All Members of the American Institute of Chemists:

A new roster of the A.I.C. members is in preparation and a roster data-sheet has been mailed to each member. Prompt return of that form is necessary, if your name and the information about you is to appear in the roster. If you have not already done so, please fill out and return the data-sheet at once. Members who fail to return the data-sheet will be listed by name only.

To the Secretary, A.I.C.

It is a privilege to be associated with the organization especially in view of the increasing importance of the chemical profession and the need for emphasizing and maintaining a high level of integrity for the individual engaged in this work. Surely the chemist has been imposed upon too much from the standpoint of unqualified persons pushing him aside; the chemist needs to stand up and assert his rights as to being a professional man and therefore entitled to the respect and standing in the community as such.

—L. B. Odell, M.A.I.C.

Products Of Tomorrow Exposition

The Products of Tomorrow Exposition is scheduled to open January 18, 1946, in the Coliseum, Chicago, Ill. The exhibit is expected to last from one to three months. Certain days will be designated to feature specific groups of products. Present plans call for a "Plastics Day", "Plywood Day", "Synthetics Day", and "Textile Day". Marcus W. Hinson is chairman of the planning committee.

Council Held On Lignin

At a special meeting of the Northeastern Wood Utilization Council, held in Orono, Maine, June 29th, the use of lignin for fertilizers was discussed. The Council is a nonprofit organization doing research on new uses for wood and wood waste in the Northeast.

New Aviation Gasoline Plants

The Petroleum Administration for War has approved the construction of five new aviation gasoline plants. Those scheduled include one at Lockport, Illinois, for the Texas Company; one at Whiting, Indiana, and at Sugar Creek, Missouri, for the Standard Oil Company; one at Alma, Michigan, for Leonard Refineries, Inc., and one at Houston, Texas, for the Shell Oil Company. The plants will be built entirely by private capital at a cost of 78 million dollars.

Chemical Training Available To Army In Europe

The Information Division of the Washington Headquarters Army Services Forces has announced an Army Education Program through which enlisted personnel and officers in the European Theatre of Operations can pursue studies in keeping with their post-war plans.

The program offers study and training in unit schools operated by and within battalions and similar military units; study in civilian educational institutions; study in special Army Study Centers; training in a centralized vocational school, and study in the army's correspondence courses through the United States Armed Forces Institute.

The first of the two Army University Centers was scheduled to open during the latter part of July in Shrivenham, England. With an enrollment of about 4000, the center will offer courses in chemistry, agriculture, commerce, education, engineering, fine arts, journalism, science and liberal arts. The courses are patterned on the American university summer session. They will be of eight weeks duration, and will be staffed by some of our prominent chemistry professors as well as by civilian specialists and educators drawn from the army.

The program is directed by Brigadier General Paul W. Thompson, Director of the Theater Information and Education Division.

Harlan Chairman Virginia Section, A. C. S.

Dr. William B. Harlan, F.A.I.C., assistant director of research for the American Tobacco Company, has been elected chairman of the Virginia Section of the American Chemical Society.

Kinney Retires

C. E. Kinney, assistant to the director of operations, Naval Stores Department, Hercules Powder Company, retired on June thirtieth, after twenty-five years of service. He will make his home in Kansas City, Mo.

Richard P. Carter has been appointed chief chemist of Hercules Powder Company's Mansfield, Mass., chemical plant. Dr. Carter succeeds Dr. R. L. Marsh, resigned.

Lauffer Receives Award

The Eli Lilly and Company Award, in biological chemistry, of $1000 and a bronze medal, has been awarded for 1945 to Dr. Max A. Lauffer, associate professor of physics, University of Pittsburgh, "for his outstanding work on the application of physical methods to the study of viruses."

Hercules Powder Company announces the appointment of William C. Hunt as assistant general manager of the Explosives Department. Mr. Hunt, formerly director of operations, will be succeeded by Harry V. Chase, who is at present manager of Hercules' Sunflower Ordnance Works at Lawrence, Kansas.

Mark M. Luckens, F.A.I.C., now holds the rank of captain at an Army Hospital in the European Theatre of Operations. As medical inspector and sanitary engineer of the post, he is responsible for sanitation and preventive medicine. He also serves as chemist for the hospital.

The Glass Container Manufacturers Institute has been organized by the glass container industry to standardize jars and bottles. The Institute has set up a budget of $250,000. George F. Lang of the Carr Lowry Glass Company, Baltimore, was elected president.

Evans Chemetics, Inc., New York, N. Y., announce that distilled thioglycollic acid in concentrations of 90-95 per cent, as well as ammonium thioglycollate in the same concentrations, are now being produced in commercial quantities at its Waterloo Plant.

Ritchie Elected Vice President

Richard J. Ritchie, chief chemist of the Pepsi-Cola Company, has been elected vice president of research and director of the Laboratory. Thomas Elmezzi, assistant chief chemist, was elected assistant vice president of the company.

J. T. Baker Chemical Company has purchased 275 acres of land, located four miles North of its present plant at Phillipsburg, New Jersey, as a first step in its post-war industrial expansion program.

The Smaller War Plants Corporation announces that its loan policy has been liberalized to enable small manufacturers making essential civilian products to obtain loans more easily.

General Latex and Chemical Corporation, Cambridge, Mass., announces the appointment of Burt Wetherbee, F.A.I.C., to its technical sales organization. He will be responsible for Western New York, Ohio, Michigan, Pennsylvania, New Jersey, and Maryland. His headquarters will be in Buffalo, N. Y.

Gladys I. Trevithick, F. A. I. C., director of Lux College, San Francisco, California, has been awarded the honorary degree of D.Sc from Dakota Wesleyan University.

Soldiers Without Uniform

The use of the "atomic bomb" against Japan drives home to us most forcibly the part being played by chemists in this war. Most of the men who have aided in the development of this powerful weapon were not in uniform. They were older men who had received their training in their youth. Today we are reaping the benefit of a policy laid down years ago — whereby chemists were permitted to continue their scientific careers without the undue interruption caused by the donning of a uniform.

Today our young chemists and scientists are faced with a different national policy and as a result, do not always find themselves in branches of the services which use their scientific training. According to Dr. Roger Adams, head of the Office of Scientific Research and Development, "War has all but stopped basic academic research and has stopped the training of research chemists and chemical engineers."

It is estimated that 150,000 potential scientists and technologists have already been lost through the present policies of selective service. The leaders of this country must be made to see the peril brought about by this situation. It is high time to return to school the many student chemists and chemical engineers now in military service so that they may continue their training. These young men are the ones who will in the future be responsible for the scientific advances which are necessary to protect our country against any aggressor, and to maintain world leadership in science and technology.

—Arthur Schroder,
Executive Director, A.I.C.

The Polytechnic Institute of Brooklyn's laboratory clinic on the weight and shape of polymer molecules was held July 23rd to July 27th under the direction of Dr. Herman F. Mark, director of Polytechnic's Highpolymer Research Bureau. Several of those attending the clinic brought samples of new rubbers and plastics for submission to the tests available at the Polytechnic Institute.

Seil on Government Mission

Gilbert E. Seil, F.A.I.C., consultant for Day and Zimmerman, Philadelphia, has been appointed a Colonel in the Army. Dr. Seil is now on his way to Europe on a special government mission.

Engagements

Mr. and Mrs. Joseph L. Vernick of Jackson Heights, N. Y., announce the engagement of their daughter, Mildred, to Lawrence M. Kushner, A.A.I.C., son of Mr. and Mrs. Hyman Kushner of Flushing, N. Y. Mr. Kushner, who was graduated in June from Queens College, will enter Princeton this fall for graduate studies.

Mr. and Mrs. Herman L. Ammann of Madison, N. J., announce the engagement of their daughter, Susan Dorothy, to C. Keith McLane, A.A.I.C. son of Mr. and Mrs. Charles F. McLane of Western Springs, Illinois. Mr. McLane received the Master of Science degree from the University of Wisconsin in May.

The United States Testing Company, Inc., Hoboken, N. J., has developed, for The War Department, a method of testing individual, rubber life-saving suits by inflating the suit with ammonia gas mixed with air. A cotton knitted garment tailored to fit the suit is placed over the specimen. The knitted garment is dyed with a sensitized yellow dyestuff which turns red in contact with ammonia. Thus any leakage can immediately be spotted from the red mark formed where the gas is escaping.

Service To Institute Members

The columns of THE CHEMIST are available without charge to all members of THE AMERICAN INSTITUTE OF CHEMISTS who are either seeking chemists or looking for new positions.

Postion Available

TEXTILE CHEMIST: Use Research Laboratory of well-known manufacturer of organic chemicals in the Midwest has an immediate, permanent position open for a man, preferably under thirty-five, with several years' experience in the textile industry, who is familiar with the problems incident to the use of chemical specialties, such as textile oils, detergents, wetting agents, etc. With limited supervision, he should be capable of conducting applied research laboratory projects, correlating data and writing well-organized reports in good English. Salary will be commensurate with qualifications. Position holds most promise for man who is qualified by reason of personality, as well as technical background, to do some technical service with manufacturers of chemical specialties for the textile industry. Please reply to Box 81, THE CHEMIST.

ADVERTISING INDEX

Baker and Adamson .... Outside Back Cover
J. T. Baker Chemical Company .... Inside Front Cover
Central Scientific Company 449
Croll-Reynolds Company 452
Edwal Laboratories, Inc. 494
W. C. Hardesty Company 453
Professional Cards 482-492
Reinhold Publishing Corporation 488
E. H. Sargent and Company 496
Texaco Development Corp. 454
Arthur H. Thomas Company .... Inside Back Cover
Universal Oil Products Co. 450

Chemical Condensates

Ed. F. Degering, F.A.I.C.

The new Sound-on-Tape machine in its first commercial model, is reported to be a neat, compact unit, which is not much longer than a table model radio receiver and records and plays back on cellophane tape with high fidelity. Tape about an inch in width and 320 feet long, permits up to 8 hours recording at a cost of only fifty cents an hour.

The hydrogen ion concentration, according to Dr. Hamer of the National Bureau of Standards, accounts for the fact that red roses are red and blue cornflowers are blue.

Over three million dollars has been provided by Congress for the continuation of the guayule program in California for another year. This involves the cultivation of 32,000 acres of guayule.

According to one estimate, about one thousand different chemicals are used in building a tank and two thousand in the over-all construction of a battleship.

One probable use for 2,3-butanediol, which is obtained by the fermentation of carbohydrates, is as a permanent type antifreeze.

R-301 is a new aluminum alloy which is used today in airplane construction. Tomorrow it may be used in cans, homes, and trains.

Toolite, a self-hardening phenolic plastic, which has been developed by Berger of Consolidated Vultee Aircraft Corporation, is claimed to be superior in many respects to aluminum and steel. One use is to replace metal machine tools and dyes in the production of aluminum aircraft parts.

A glass cloth, coated with synthetic rubber, which is flame proof and resistant to deterioration by acid, alkali, gasoline, grease, oil, insects, mildew, and water, has been developed by U. S. Rubber Co.

Neoprene-fiberglas conveyer belts, produced by B. F. Goodrich Company, claim to give long and dependable service.

Minerals valued at $8,543,000,000 were produced in Alaska and the United States during 1944.

It is estimated that one-eighth of the gold and silver mined since 1500 A.D., now lies unclaimed at the bottom of the ocean.